



Ocean Exploration  
and Research

# Office of Ocean Exploration and Research Review

# Overview

- Office of Ocean Exploration and Research Timeline
- OER Vision, Mission, and Goals
- Drivers for Ocean Exploration
- Review of Three Primary Areas of Activity
  - Exploration and Expeditions
  - Science and Technology
  - Education and Engagement
- Data Management
- Operational and Interagency Partnerships

# Timeline of Key Events for OER

2001 — NOAA Office of Ocean Exploration established in response to the President's Panel report

2001-2005 — “Targeted Exploration,” or competitive grants for exploration, is the Office's primary focus

2004-2009 — *Okeanos Explorer* retrofit, commissioning, and sea trials

2005 — NOAA-BOEM partnership formed under NOPP

2006 — NOAA Science Advisory Board forms the Ocean Exploration Advisory Working Group

2007 — Ocean Exploration and the National Undersea Research Program “merged”

2008 — Extended Continental Shelf Project initiated

# Timeline of Key Events for OER

2009 — Congress passes authorizing legislation for ocean exploration (“PL 111-11,” or 33 U.S.C. 3401 et seq)

2010 — First *Okeanos Explorer* expedition, to Indonesia

2011 — Competitive Grants suspended; existing projects end in 2012

2012 — First independent review of NOAA Ocean Exploration program

2012 — Task Force for Ocean Exploration and Research Technology Infrastructure established under 33 U.S.C. 3404

2012 — NURP Terminated

2013 — Ocean Exploration 2020: A National Forum held in response to 33 U.S.C. and the independent review

2014 — Competitive Grants program restored

2014 — OEAB established



# OER Vision, Mission, Goals

OER strategic plan for FY 11-15 - reflects OE-NURP merger

*Vision* — A society that understands the importance of a healthy ocean to all life on Earth and is informed and inspired by discoveries that reveal the wonders, mysteries, and workings of the ocean

*Mission* — Develop and use state-of-the-art technology to increase our scientific knowledge of the Earth's largely unknown ocean, in all its dimensions to support NOAA and national priorities

# OER Vision, Mission, Goals

## *Strategic Goals*

1. Conduct scientific baseline characterizations of unknown or poorly understood known ocean basin boundaries, processes, and resources
2. Transition ocean exploration discoveries to new research areas and research results to new applications to benefit society
3. Increase the scope, pace, and efficiency of exploration and research through advancement of underwater technologies
4. Engage audiences through innovative means by integrating science, education, and outreach

# Drivers for OER

- Authorizing legislation (33 U.S.C. 3401, et seq)
  - conduct expeditions
  - focus on the deep ocean
  - include marine archeology
  - implement a competitive grants process
  - promote improved technology for exploration
  - establish a national forum
  - establish an interagency technology task force
  - establish an Ocean Exploration Advisory Board
- National ocean policy Implementation Plan, other guidance
  - Advance fundamental scientific knowledge through exploration and research
  - Advance technologies
  - Increase ocean and coastal literacy

# Drivers for OER



- NOAA priorities
  - Make communities more resilient
  - Evolve the Weather Service
  - Invest in observational infrastructure
  - Achieve organizational excellence
- NOAA mission program activities
  - Cross-line planning and coordination
- Community needs
  - Exploration priority workshops
  - National Forum results
  - Other sources



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# Exploration and Expeditions



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# Systematic Telepresence-enabled Ocean Exploration

# Telepresence-enabled Exploration: What We Do

## Collaborative systematic baseline deep ocean characterization

- Plan and conduct multi-year campaigns of deep ocean exploration expeditions to produce baseline characterizations
- Produce high-quality and publicly share real-time data to catalyze management, research, and economic activity
- Advance a new paradigm for telepresence-enabled exploration or ocean tele-exploration, transitioning advances to other ocean platforms and applications
- Test, develop, and implement advanced technologies and best practices to increase the pace and efficiency of ocean exploration

## *Okeanos Explorer Capabilities*

**Mapping:** Sub-bottom, bottom, and water column characterization to 7,000 meters

**ROVs:** High-definition characterization imaging and sensing to 6,000 meters

**Telepresence:** Up to 20 mbps ship to shore, live distributed event logging, unlimited science community collaboration, shore-based Exploration Command Centers, and public web streaming

**Data:** Fully documented, high-quality data pipeline, dock to archive in 45 days or less.



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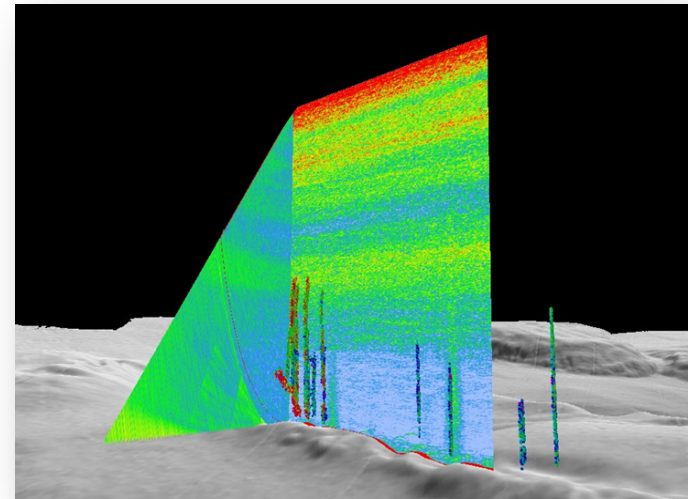
# Telepresence-enabled Exploration: Why We Do It

## Serving NOAA, the nation, and the public

Fulfill Public Law 111-11 Mandates to conduct ocean exploration expeditions

Advance NOAA's Observational Infrastructure and Resilient Coastal Communities goals by:

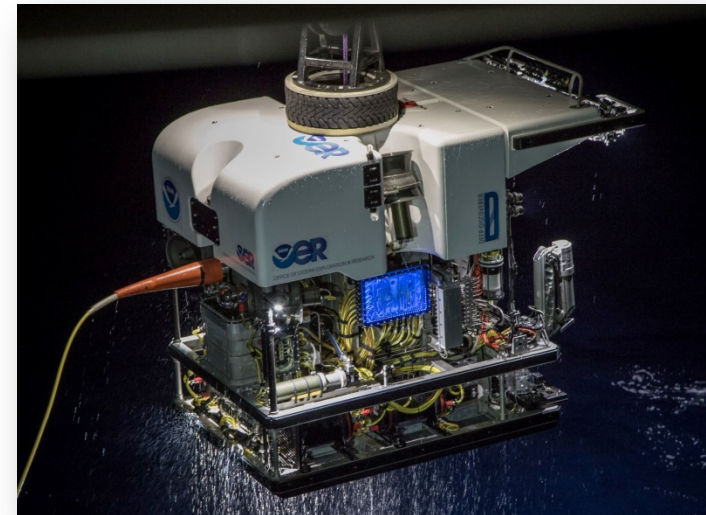
- Providing deep ocean environmental intelligence for informed critical decisions
- Advancing technology to increase the pace of characterization in the deep ocean
- Engage scientists, managers, industry, students, and the citizen explorers to improve understanding and decisions





# Telepresence-enabled Exploration: What's Next

- Winter/Spring 2015: Caribbean Exploration – Two months of mapping and ROV characterization
- Summer 2015 – Spring 2017: CAPSTONE: Two years of cross-NOAA, cross-agency collaborative exploration of existing and expanded monuments and surrounding areas in central and western Pacific ocean
- Summer 2017: Back to Atlantic Ocean? Indian Ocean? Joint US-Canadian-EU Campaign?





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# The U.S. Interagency Extended Continental Shelf Project

# U.S. ECS Project: What We Do

ECS Project focus: delineate outer limits of U.S. continental shelf, consistent with international law.

Project carried out through ECS Task Force established April 2007

- Chaired by U.S. Department of State, co-vice chaired by Department of the Interior and National Oceanic and Atmospheric Administration.
- Reports to National Ocean Council Steering Committee



# U.S. ECS Project: Why We Do It

- Improve understanding of geology, extent of U.S. ECS (UNCLOS implications)
- Contribute to national continental shelf mapping priorities
- Make high-resolution bathymetric mapping data publicly available



*2003-2014 equivalent area mapped over 2 million km<sup>2</sup> mapped at 100-m resolution*



# U.S. ECS Project: What's Next?

## FY 15

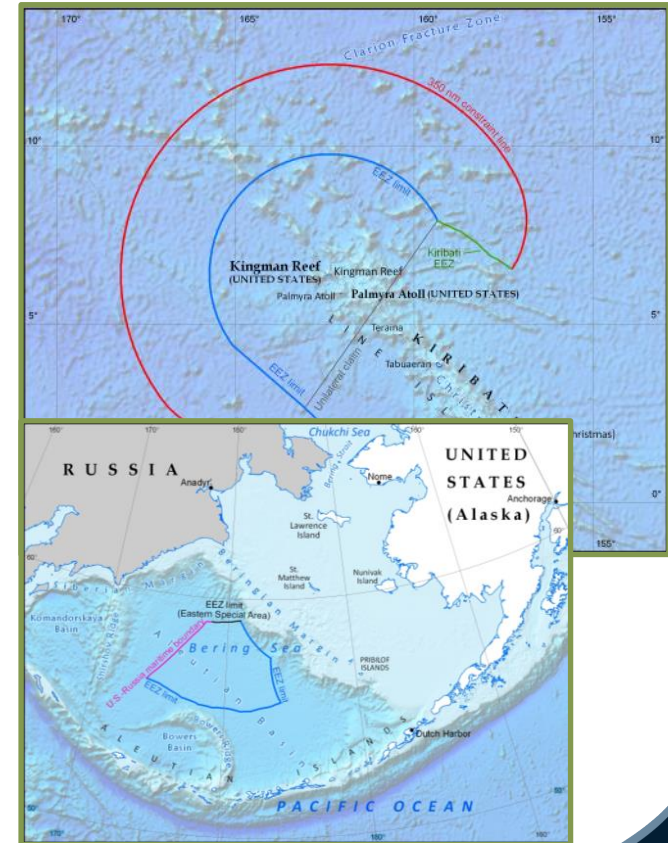
- Regional Analyses of the Bering Sea, Mendocino Ridge, and Atlantic Margin
- Bathymetric Cruise : Atlantic or Palmyra Atoll
- Atlantic seismic cruise

## FY 16-17

- Additional Regional Analyses
- Expeditions to targeted areas in 2016 and 2017 will likely complete the mapping requirement to define potential extensions in the Atlantic and surrounding U.S. territories in the Pacific

## FY 18

- To be determined





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# Marine Archaeology

# Marine Archaeology: What We Do

Coordinate within NOAA, across agencies, and with outside organizations to discover archaeological evidence that contributes to our better understanding of past human culture.

- Contribute to NOAA's submerged cultural heritage mission
- Support marine archaeology via OER competitive grants program
- Leverage partnerships with BOEM, Office of Naval Research, Boeing, and others
- Support use of advanced undersea technologies for marine archaeology



# Marine Archaeology: Why We Do It

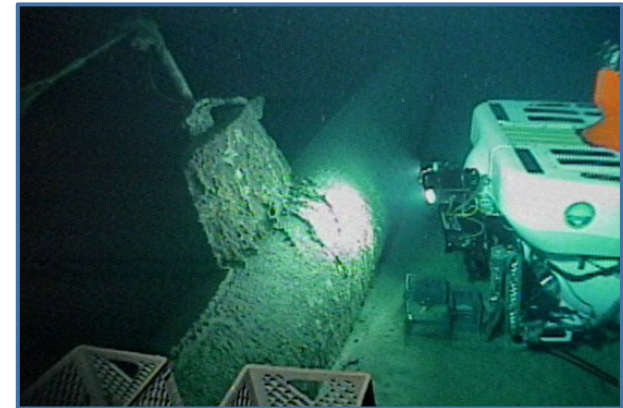
Support NOAA's mission to discover and scientifically characterize archaeological resources to fill gaps in knowledge of human past

- Required under 33 U.S.C. 3403 (PL 111-11)
- Addresses cultural resource management and protection issues important to NOAA, federal partners, and others
- Addresses current relevant topics in the study of past human cultures
- Increases capabilities, efficiency, and accuracy of archaeological characterization



# Marine Archaeology: What's Next

- Offer dedicated funding for marine archeology under the competitive grants program in FY 15
- Develop capabilities for ROV *Deep Discover* to map and sample archaeological sites
- Collaborate with BOEM and other partners on work in the Gulf of Mexico, on the west coast, and in the Pacific
- Support advanced technology for marine archaeology





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# Science and Technology



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# Competitive Grants

# Competitive Grants: What We Do

Engage expertise of national / international ocean science and technology communities in expeditions and projects by:

- Implementing partnerships
- Soliciting and funding proposals through annual Federal Funding Opportunity announcement via peer review process
- Direct funding through existing agreements

# Competitive Grants: Why We Do It

OER provides Competitive Grants to:

- Augment and complement OER's systematic telepresence-enabled exploration
- Catalyze OER discoveries into research and leverage partner resources to advance exploration and research
- Further NOAA mission priorities

# Competitive Grants: What's Next

- FY15: Align Competitive Grants program to focus on high-priority issues and follow-up on important, NOAA-relevant discoveries in the Arctic
- FY15: Federal funding opportunity utilizes peer review process to evaluate proposals; Summer 2015 awards anticipated
- FY16 and beyond: Continue examining optimal alignment / utility / resourcing of federal funding opportunity processes



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# Advancing Technology

# Advancing Technology: What We Do

Coordinate within NOAA and across agencies to advance technologies capable of increasing exploration capabilities

- Use the *Okeanos Explorer* as a test bed for new technologies and approaches to ocean exploration
- Lead interagency Task Force for Ocean Exploration and Research Technology and Infrastructure (TFORT)
- Lead intra-NOAA Ocean Observations Innovation Forum
- Provide funding through the Competitive Grants program, cooperative institutes, and leveraging partner resources to develop innovative tools and sensors



# Advancing Technology: Why We Do It

- Required by 33 U.S.C. 3403 (PL 111-11) and responsive to OE 2020 recommendations
- Increase scope, efficiency and pace of exploration across the community
- Increase ocean knowledge through new platforms and sensors
- Increase yield of high quality publicly accessible baseline environmental intelligence about the deep ocean

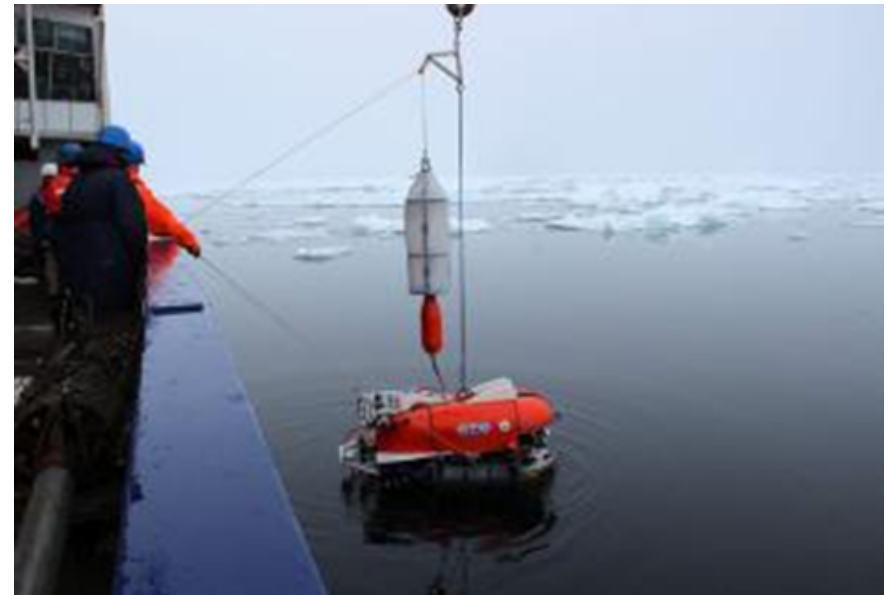


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# Advancing Technology: What's Next

## Future directions and opportunities

- Continued AUV, UAV, and other technology demonstrations for exploration and other high priority NOAA mission objectives
- Engage industry to advance “sensor” development and “in-situ” sample analysis methods for shipboard, tethered and untethered vehicle use.
- Integrate AUV's, UAV's into telepresence enabled exploration
- Share and transfer telepresence model to other NOAA missions.





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# Education and Engagement

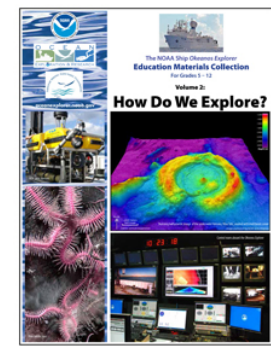
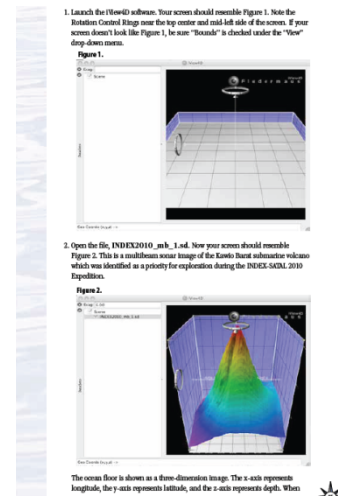


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# Education

# Education: What We Do

- Translate OER “science story” through education products and professional development
- Expedition-based education products for “signature” missions covered on NOAA Ocean Explorer website
- Partnerships for informal education
- Online workshops for educators



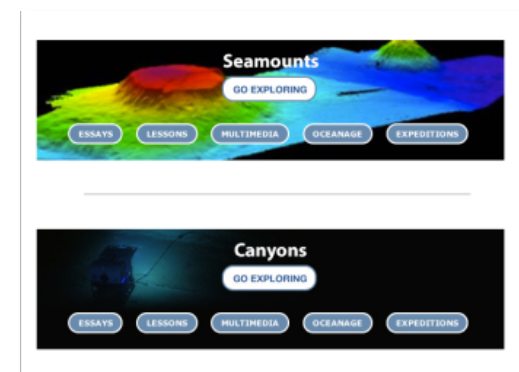
# Education: Why We Do It

- 33 U.S.C. 3402 (PL 111-11)
- National Ocean Policy
- NOAA Mission
- NOAA Education Strategic Plan



# Education: What's Next

- Challenger Center: Ocean focus
- Q?rius Integration
- ECC Integration
- ISC Collaboration
- Build capacity of existing education products
- Develop higher education component of core material



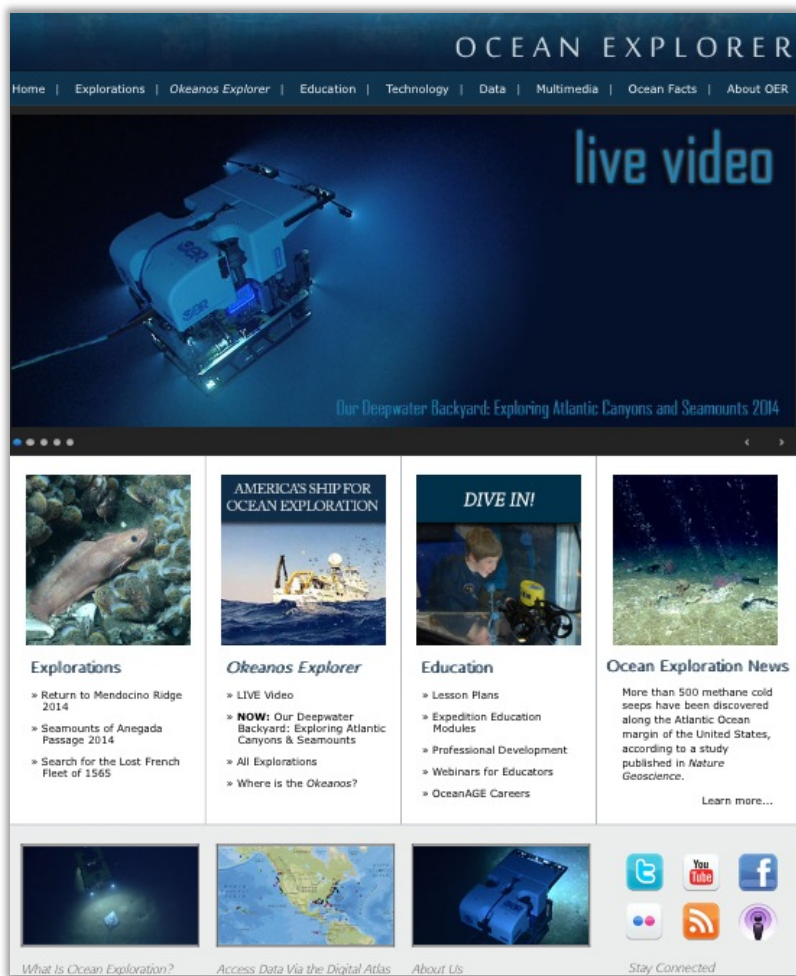


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# Web & Social Media



# Web & Social Media: What We Do



OceanExplorer.NOAA.gov

NOAA Ocean Explorer website: <http://oceanexplorer.noaa.gov>

## Social media accounts:

- Twitter: @oceanexplorer
- Facebook: OceanExplorationResearch
- YouTube: oceanoexplorergov
- Flickr: oceanoexplorergov



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# Web & Social Media: Why We Do It

## Communication Objectives:

- Build understanding of ocean exploration value and importance
- Increase OER recognition and awareness
- Highlight partnerships and partner achievements

## Why Online Tools:

- Larger audience reach, lower cost
- Where and how people are looking for info (expected)
- Drive traffic to NOAA Ocean Explorer website (social media)



# Web & Social Media: What's Next

## Fiscal Year 2015 Focus:

- Expedition coverage
- Enhancement of website video and image galleries
- Mobile-friendly content development
- Science and technology stories, beyond expeditions
- Increased and targeted use of social media to engage and interact

## Beyond FY15:

- Full website redesign



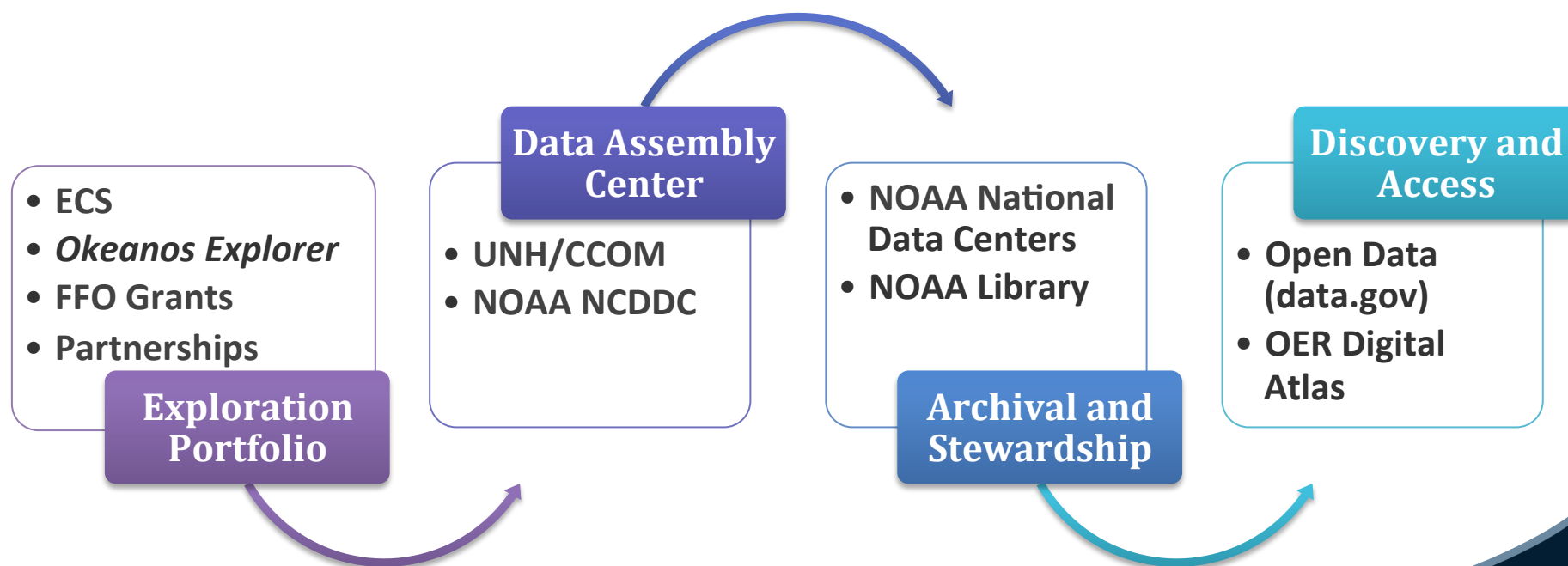


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# Data Management

# Data Management: Who We Are

A collaborative partnership drawing on expertise  
from across NOAA line offices and extramural partners



# Data Management: What We Do

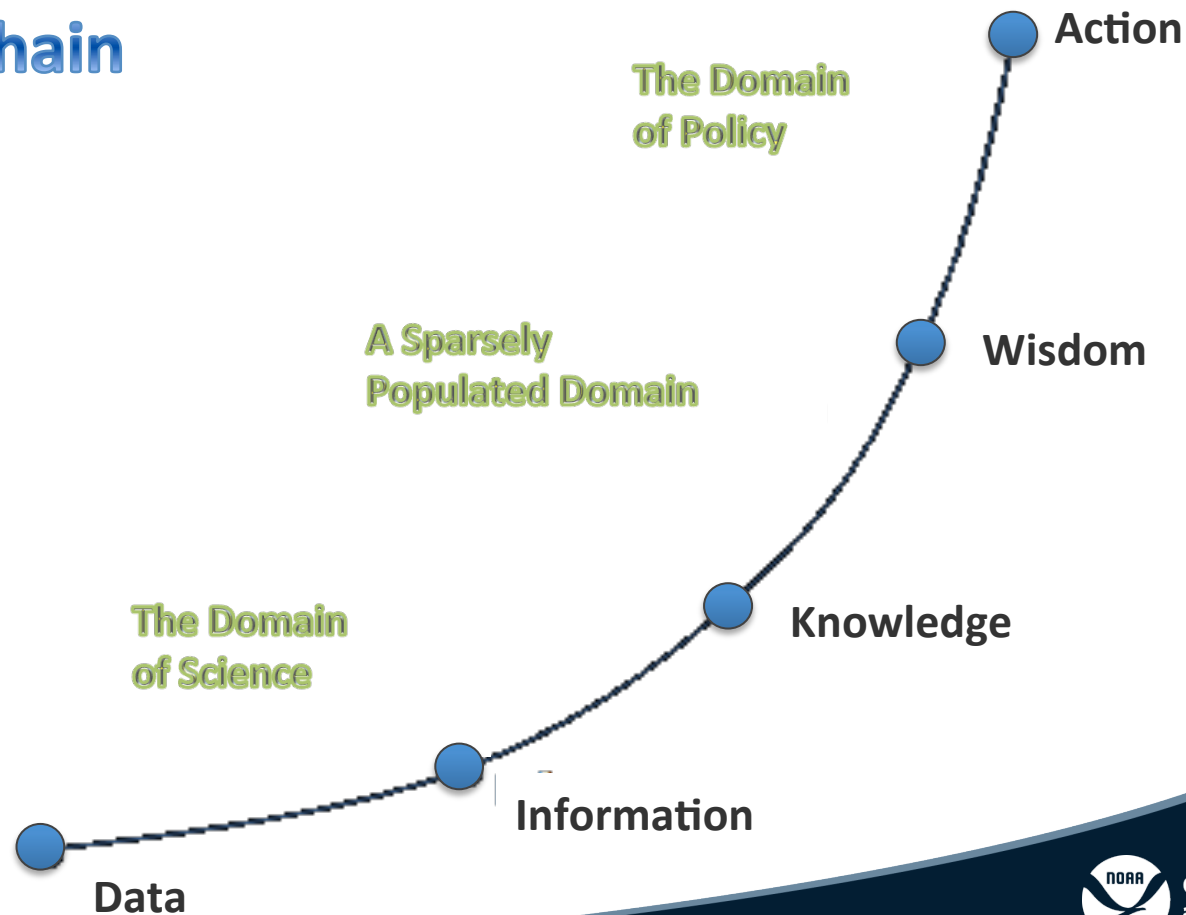
## Setting the bar for rapid and unfettered data sharing

- Building and operating effective and efficient data management systems
  - Ensure National Open Data initiatives / NOAA policy compliance
  - Identify and fill infrastructure gaps in lifecycle systems
  - Lead, develop, implement, and transfer technology
- *Okeanos Explorer* as data management test platform
  - Average 45-day turnaround from dock to public access
  - Fully documented, QA/QC data
  - “A Standard for the Fleet”



# Data Management: Why We Do It

## The Ocean Knowledge Value Chain





# Data Management: Results

Immediate, actionable information for scientists, decision makers

- Innovative device for real-time annotation
- Adaptive operational management
- Real-time data assessment
- Model ground truthing
- Precise targeting for follow-on proposals





# Data Management: Next Steps

## Data management champion

- Continue and expand partner collaboration

## Large volume data management

- Leading NOAA in implementation of video data management
- Amazon Cloud pilot project

## Products

- Periodic reassessment of internal production methods and status
- Public/private partnerships to increase targeted product offerings



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# Partnerships



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# Operational Partnerships

# Operational Partners

OER depends on external partners for virtually all of its activities in operations, research, technology development, education, and more. Key partners include:

- *Ocean Exploration Trust (OET)*
- *Global Foundation for Ocean Exploration (GFOE)*
- *University of Rhode Island – Graduate School of Oceanography (URI/GSO)*
- *University of New Hampshire – Center for Coastal and Ocean Mapping and Joint Hydrographic Center (UNH/CCOM-JHC)*
- *Cooperative Institute for Ocean Exploration, Research & Technology (CIOERT)*
- *NOAA/OAR Pacific Marine Environmental Lab (PMEL)*

# How Do We Collaborate?

- *OET* – Operates the EV Nautilus under the telepresence-enabled expedition model through a Joint Project Agreement with OER
- *GFOE* – Designs, builds, tests, and operates undersea systems for NOAA Ship Okeanos Explorer through an education and mentorship program as part of the telepresence-enabled expedition model
- *URI/GSO* – Operates the Inner Space Center in support of telepresence-enabled expeditions

# How Do We Collaborate?

- *UNH/CCOM-JHC* – responsible for sonar data acquisition and analysis in support of the interagency ECS effort and supports end-to-end mapping operations for NOAA Ship Okeanos Explorer
- *CIOERT* – Works with OER and other NOAA programs to explore frontier areas of the ocean using innovative technologies
- *PMEL* – Works with OER and other NOAA programs to explore remote regions of the Pacific and Arctic using innovative technologies and investigates poorly known oceanographic phenomena

# Why Do We Collaborate?

Operational partnerships allow a small program to have great impact. Partners allow us to:

- *Leverage* other sources of funding – each key operational partner contributes
- *Design, develop, test and evaluate*, and to transition new technologies
- *Develop new methods* for processing and archiving data, and developing and disseminating new data products

All to increase the pace and efficiency of ocean exploration

# What's Next?

- *OET* – Telepresence-enabled expeditions in the Pacific on the EV *Nautilus*
- *GFOE* – Continued support of undersea mission system operations on NOAA Ship *Okeanos Explorer* during the CAPSTONE Campaign, and the develop of new techniques for ‘virtual’ sampling
- *URI/GSO* – Continue to function as the hub for telepresence-enabled expeditions
- *UNH/CCOM-JHC* – Continue sonar data acquisition and analysis in support of the interagency ECS and support of survey operations for telepresence-enabled expeditions
- *CIOERT* – Expand on the success of the Pulley Ridge mesophotic coral investigation into new areas in the Gulf of Mexico and Caribbean
- *PMEL* – Continue to explore the “Ring-of-Fire,” the Arctic, and oceanographic phenomena using and testing new technologies





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# Interagency Partnerships

# Interagency Partnerships: What We Do

Award-winning interagency partnership among NOAA-BOEM-USGS

- Over a decade of successful missions throughout the Gulf of Mexico and in the Atlantic
- Partnership expanded beyond environmental studies



# Interagency Partnerships: Why We Do It

Leverage capabilities and extend limited budgets, enhancing scientific knowledge and conservation goals of all agencies



- Explore unknown and poorly known ocean regions
- Baseline habitat characterization
- Understand and manage implications for ecosystem management



- Evaluate the health of ecosystems
- Inform resource management
- Understand natural hazards



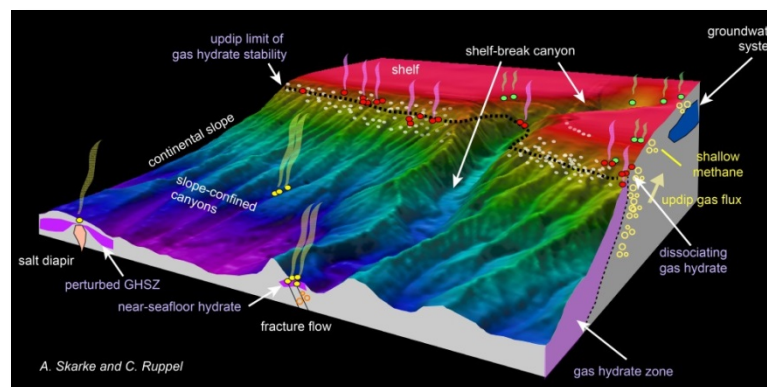
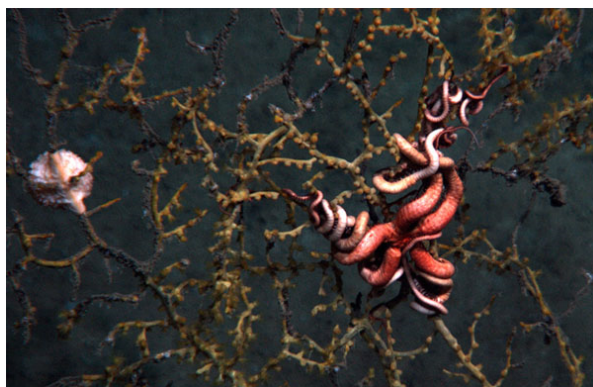
- Adaptive management
- Discovery of sensitive resources
- Evaluation of impacting resources and refinement of policy



# Interagency Partnerships: Our Results

High impact, far reaching results

- First post-Deepwater Horizon documentation of impacts to deep-sea benthic habitats
- Discovery of over 570 new methane plumes along US East Coast
- Discovery and characterization of over a dozen submerged cultural resources
- Results have lead to regulatory changes and increased protection



# Interagency Partnerships: What's Next

- Completion of Mid-Atlantic Canyons project (2015)
- Additional work/continuation in the Gulf of Mexico and Atlantic
- Extend this model to work in Alaska and Arctic
- Adapt this model to work with other agencies
- Continue engagement through *Okeanos Explorer* missions







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[OceanExplorer.NOAA.gov](https://oceanexplorer.noaa.gov)